A Renewed Spirit of Discovery:

Meeting the Project Management Challenge
March 30, 2004

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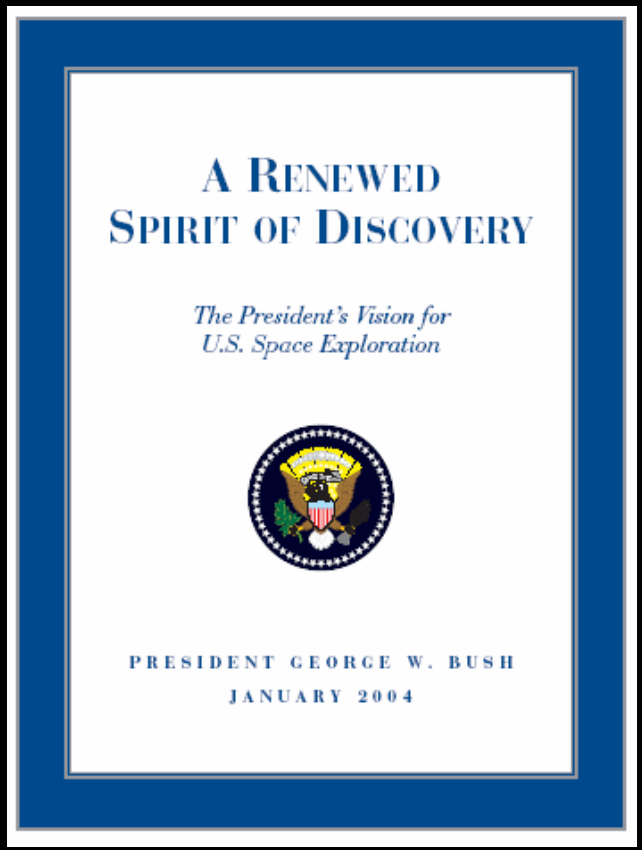
Deputy Associate Administrator
Technical Program

On January 14, 2004, President Bush established a new vision for U.S. space exploration that is bold and forward-thinking yet practical and responsible

The President's vision is documented in *A Renewed Spirit of Discovery, The President's Vision for U.S. Space Exploration*.



"This cause of exploration and discovery is not an option we choose; it is a desire written in the human heart."

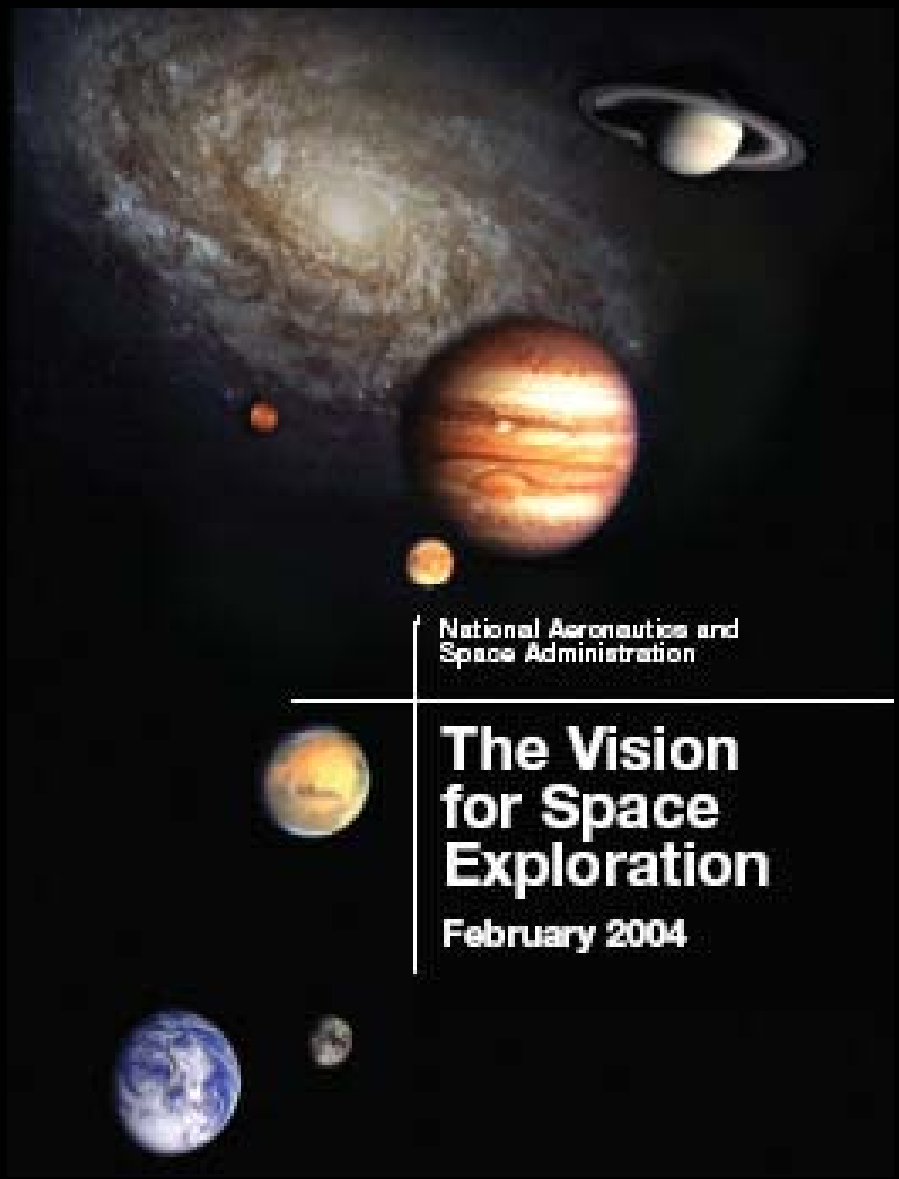
President George W. Bush
February 4, 2003

"We leave as we came, and God willing as we shall return, with peace and hope for all mankind."

Eugene Cernan (Commander of last Apollo mission)
December 17, 1972

". . . America will make those words come true."

President George W. Bush
January 14, 2004



Our aim is to explore in a sustainable, affordable, and flexible manner. We believe the principles and roadmap set down in this document will stand the test of time. Its details will be subject to revision and expansion as new discoveries are made, new technologies are applied, and new challenges are met and overcome.

Policy Goals

Sustained and affordable human and robotic program to explore the solar system and beyond

Extend human presence across the solar system

Develop innovative technologies, knowledge and infrastructures

Promote international and commercial participation in exploration

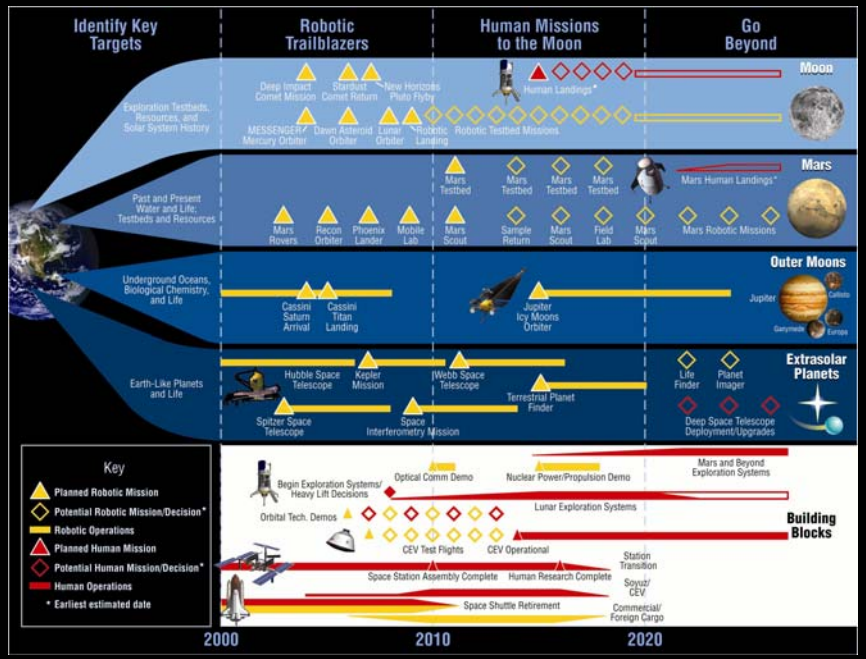
Guiding Principles for Exploration

In pursuit of the exploration vision, NASA has identified six guiding principles:

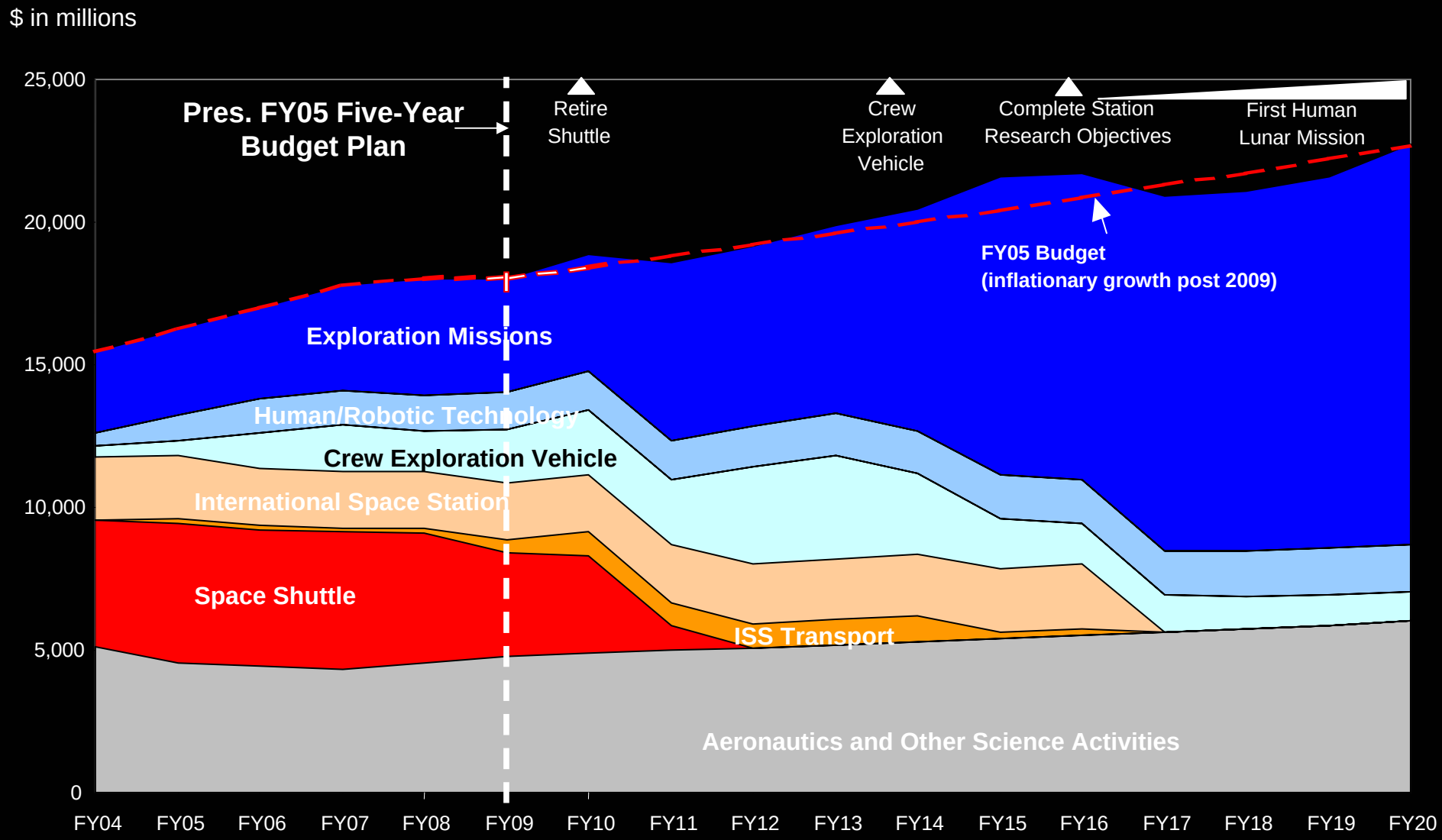
1. Pursue Compelling Questions
2. Across Multiple Worlds
3. Employ Human and Robotic Capabilities
4. For Sustainable Exploration
5. Use the Moon as a Testing Ground For Mars and Beyond
6. Starting Now

Exploration Program Elements

Consistent with *The President's Vision for U.S. Space Exploration*, NASA has set a new course for exploration and discovery, as summarized in the exploration roadmap. Implementation of the exploration vision will be informed by the recommendations of the Aldridge Commission.



Strategy Based on Long-Term Affordability

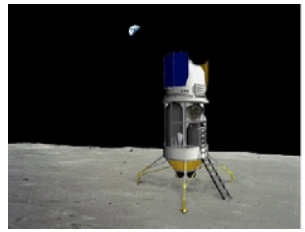


NOTE: Exploration missions – Robotic and eventual human missions to Moon, Mars, and beyond
Human/Robotic Technology – Technologies to enable development of exploration space systems
Crew Exploration Vehicle – Transportation vehicle for human explorers
ISS Transport – US and foreign launch systems to support Space Station needs especially after Shuttle retirement

Organizational Changes

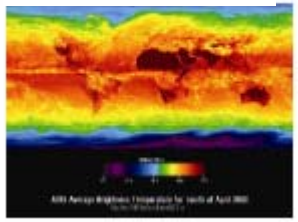
To successfully execute the exploration vision, NASA will focus its organization, create new offices, align ongoing programs, experiment with new ways of doing business, and tap the great innovative and creative talents of our Nation.

Exploration Systems



Space Flight

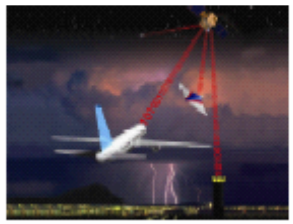
Earth Science



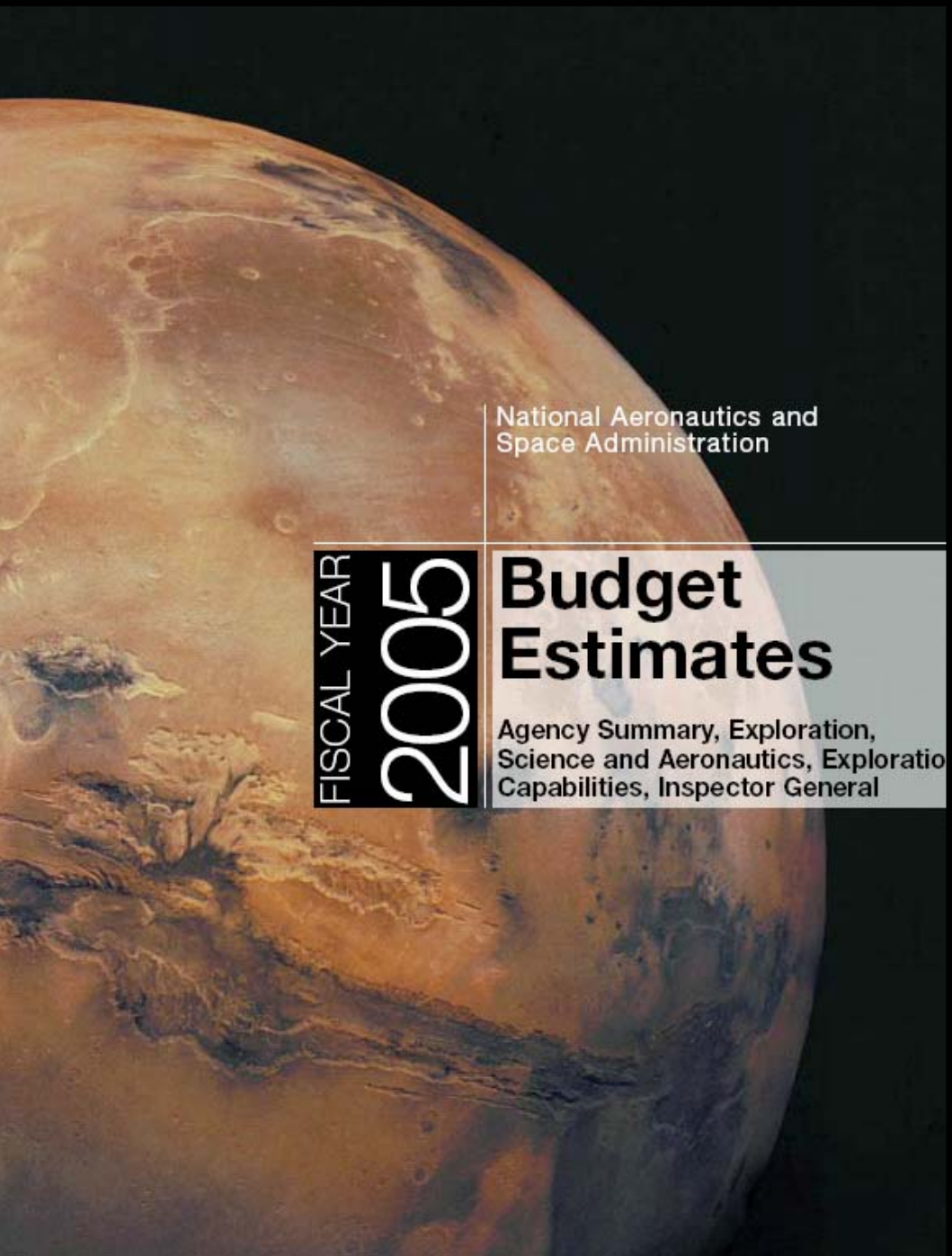
Space Science

Education

Aeronautics



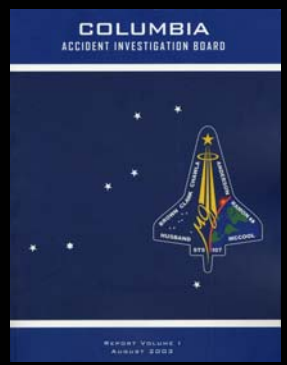
Biological / Physical



Starting Now

Space Shuttle Return To Flight

"Return the Space Shuttle to flight as soon as practical, based on the recommendations of the Columbia Accident Investigation Board"



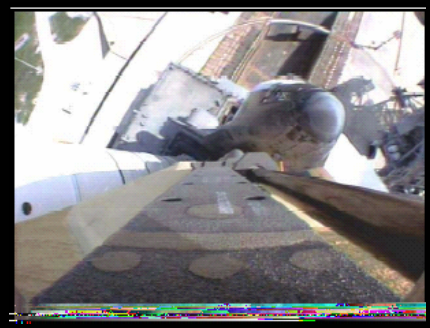
Return to Flight Critical Path

1. Determining debris liberation, transport mechanisms, and ascent imagery

2. Orbiter
   - RCC Inspection/Installation
   - Rudder Speed Brake Corrosion
   - Tile, Wire and Flex Hose Inspections

3. External Tank
   - Bipod Foam Ramp Redesign
   - Feedline Bellows Redesign
   - Intertank Flange Debris Prevention

4. Added System Capabilities
   - On-Orbit Tile/RCC Inspection/Repair
   - Boom and Sensor Installation
   - Ground Camera Coverage

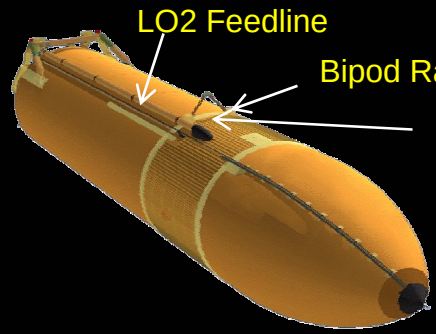


Vehicle Imagery

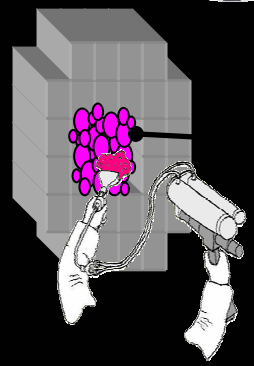
Tile Bonding

Ground Cameras

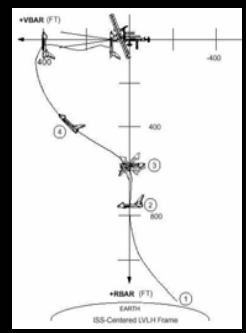
Bipod Foam Ramp



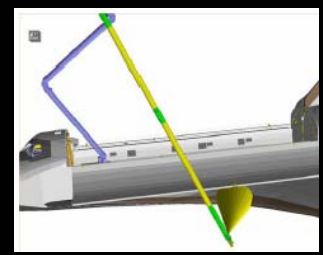
On-orbit Boom inspection



Tile Repair



On-orbit inspection from Station



External Tank Foam Shedding

1. **Forward Bipod Ramps**
   - Redesign in work
   - Critical Design Review held Nov 13
   - Issue over assessing increased thermal heating environments

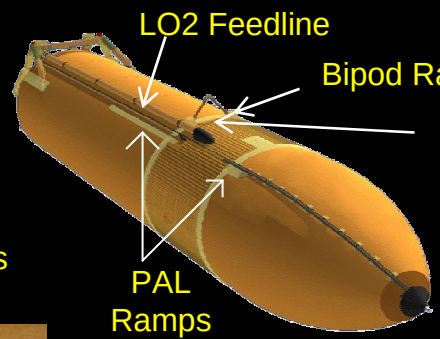
2. **LO2 Feedline Bellows**
   - Redesign in work
   - Condensate drain 'drip lip' with foam insert established as the baseline

3. **Protuberance Airload (PAL) Ramps**
   - Potential debris source – non-destructive evaluation and analysis underway

4. **LH2 Intertank Flange Closeout**
   - Activities underway to determine specific cause of foam loss and eliminate through design/process enhancements

Bipod Redesign

LO2 Feedline Bellows

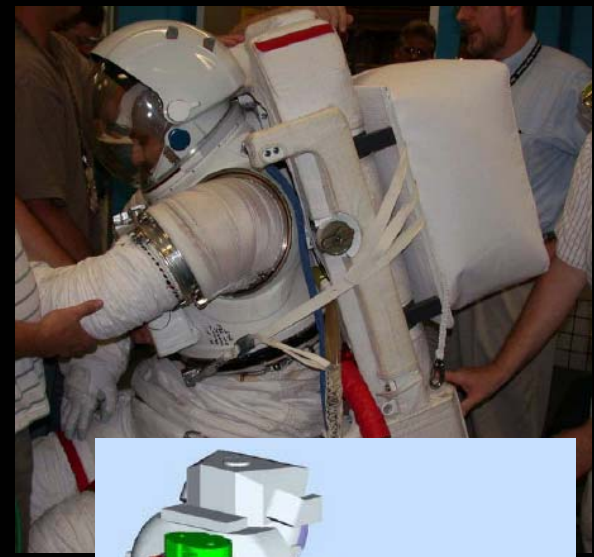


LO2 PAL Ramp

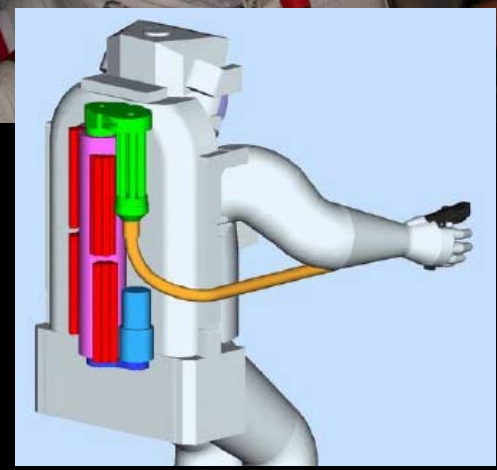
Intertank Flange

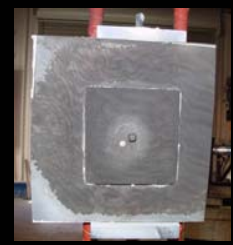
On-Orbit TPS Repair

- **Tile Repair**
  - Tile repair tools, including the ablator applicator are in the last phases of development
  - Mods to the EMU for mounting the ablator back-pack and SAFER hand controller are ongoing
- **RCC Repair**
  - Early concepts for EVA tools have been proposed for the current options under consideration
- **Common Development**
  - Training mock-ups and models
  - Design continues on boom stabilization technology (adhesives and footpads)
  - Concept development of the extended length safety tether for inspection contingencies using SAFER
  - Implementing EVA portion of TPS Repair capability is currently estimated at $9.3M



Ablator Back Pack





RCC Patch Concepts

Space Shuttle Phase Out

“Focus use of Space Shuttle to complete ISS assembly “

“Retire the Space Shuttle as soon as ISS assembly completed, planned for the end of this decade”

Complete The International Space Station

“Complete assembly of the International Space Station, including the U.S. components that support U.S. space exploration goals and those provided by foreign partners, planned for the end of this decade”

Halfway to International Partner Core Configuration

Mass: 392,200,000 lbs
- 72% US Core
- 34% IP Core

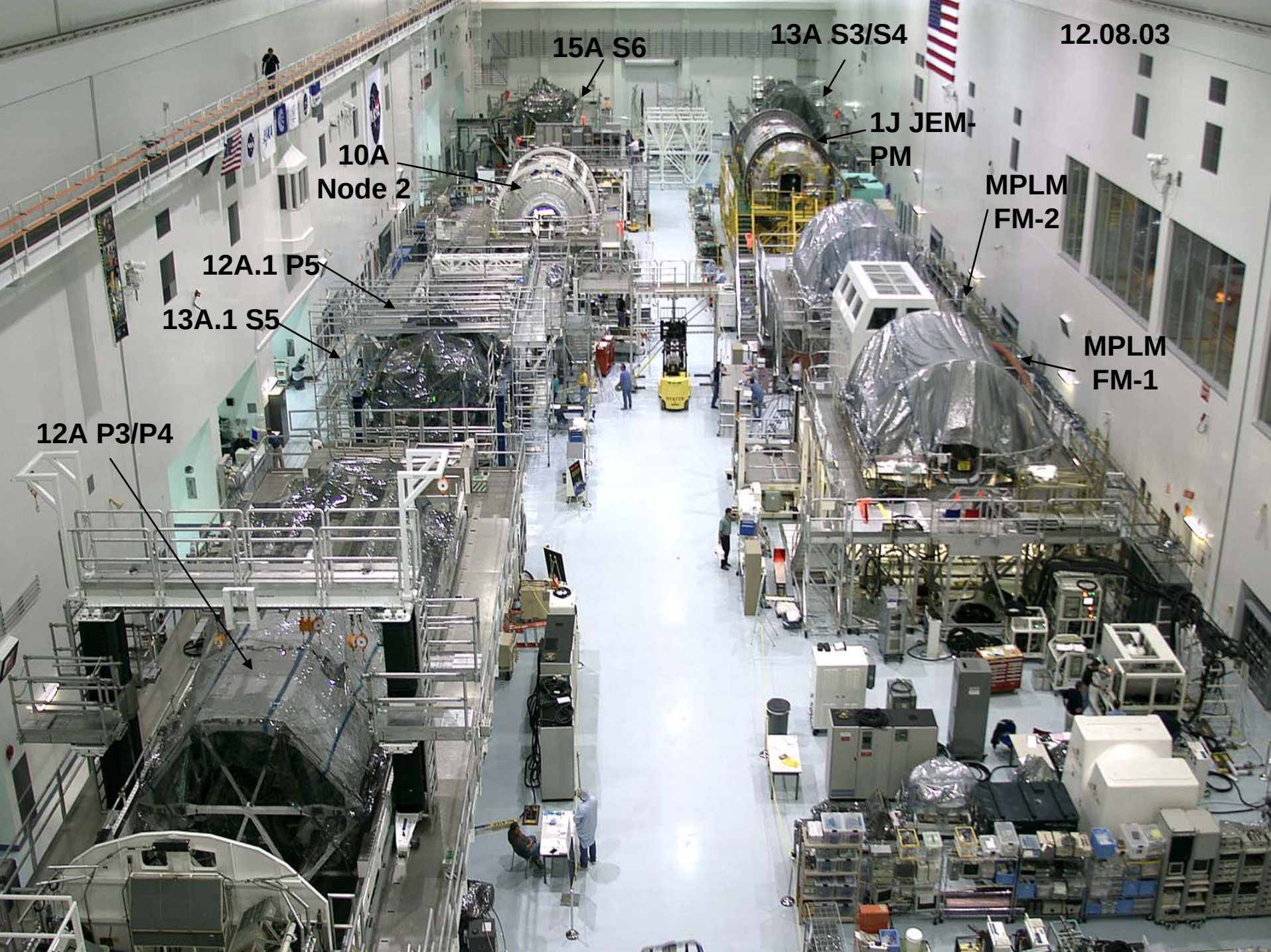
Volume: 14,791 cubic ft
- 80% US Core
- 41% IP Core

Elements: 16 on-orbit
- 80% US Core
- 55% IP Core

Research Racks: 7
- 70% US Core
- 27% IP Core

Elements On-Orbit

- FGB Zarya
- Unity Node and Destiny Lab
- 3 Pressurized Mating Adapters
- Service Module Zvezda
- Z1 Truss
- P6 Solar Array
- CanadArm 2, Mobile Base System &Transporter
- Quest U.S. Airlock
- Pirs Russia Docking Compartment
- S0 Central Power Data Truss
- S1 Right Truss
- P1 Left Truss


15A S6
13A S3/S4
12.08.03
1J JEM-PM
10A Node 2
MPLM FM-2
12A.1 P5
13A.1 S5
MPLM FM-1
12A P3/P4

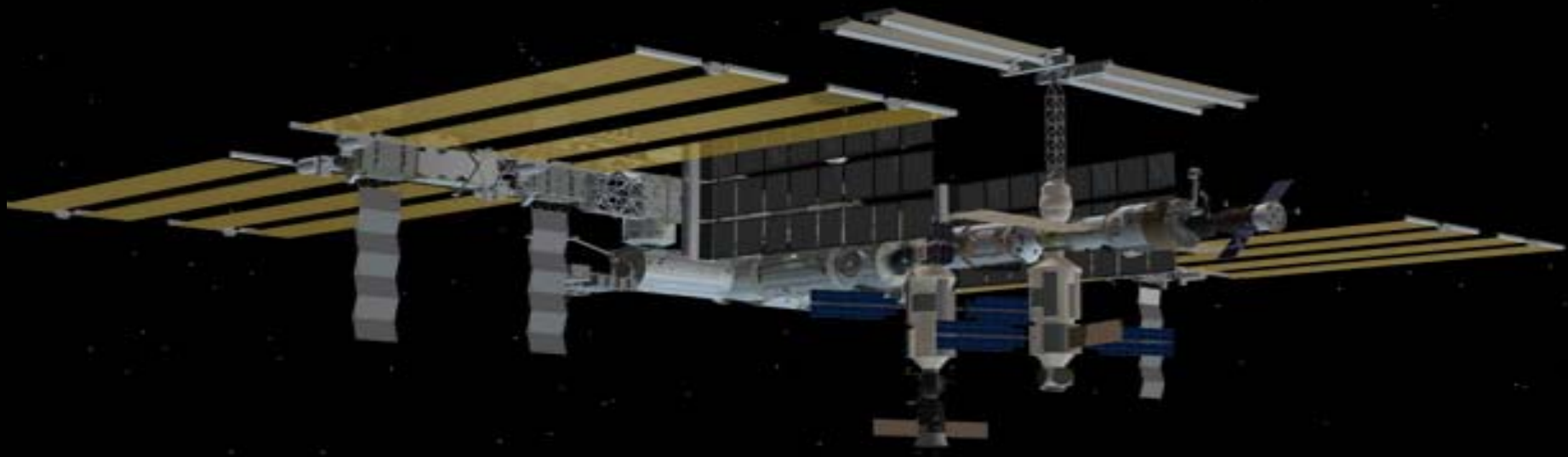
Space Station Status Today

- Crew restricted to two
- Assembly on hold
- Dependent on partnership for crew exchange and resupply
- Critical consumables currently on board are maintainable thru Spring 2004
- Hardware in good shape
- Limited science continues

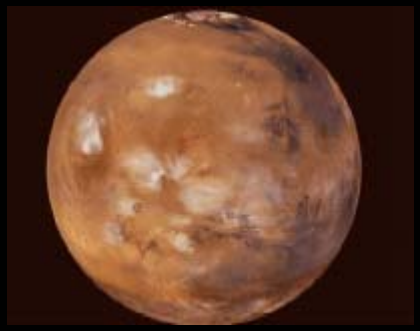
Use ISS as a Stepping Stone

"*Focus U.S. research and use of the International Space Station on supporting space exploration goals, with emphasis on understanding how the space environment affects astronaut health and capabilities and developing countermeasures*"

"Conduct International Space Station activities in a manner consistent with U.S. obligations contained in the agreements between the United States and other partners in the International Space Station."

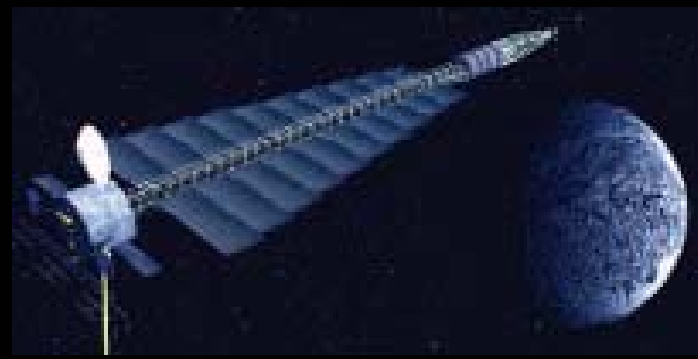


Robotic Exploration of the Solar System



"Conduct robotic exploration across the solar system for scientific purposes and to support human exploration. In particular, explore Jupiter's moons, asteroids and other bodies to search for evidence of life, to understand the history of the solar system, and to search for resources"

Over the next two decades, NASA will send increasingly advanced robotic probes to explore our solar system and beyond, including our Earth's Moon, Mars, the moons of Jupiter, and other outer planets, and launch new space telescopes to search for planets beyond our solar system.



Human and Robots as Partners

NASA will send human and robotic explorers as partners, leveraging the capabilities of each where most useful.

Robotic explorers will visit new worlds first, to obtain scientific data, assess risks to our astronauts, demonstrate breakthrough technologies, identify space resources, and send tantalizing imagery back to Earth.

Human explorers will follow to conduct in-depth research, direct and upgrade advanced robotic explorers, prepare space resources, and demonstrate new exploration capabilities.

Lunar Exploration

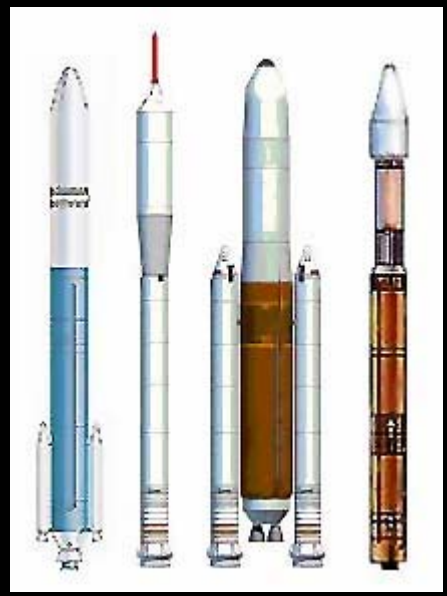
“Undertake lunar exploration activities to enable sustained human and robotic exploration of Mars and more distant destinations in the solar system”

Starting no later then 2008, NASA will initiate a series of robotic mission to the Moon

NASA will conduct the first extended human expedition to the lunar surface as early as 2015

Space Transportation Capabilities

"Develop a new crew exploration vehicle to provide crew transportation for missions beyond low Earth Orbit"



For future crew transport, NASA will undertake *Project Constellation* to develop a Crew Exploration Vehicle (CEV).

The CEV will be developed in stages, with the first automated test flight in 2008, more advanced test flights soon thereafter, and a fully operational capability no later than 2014.

Use the Moon as a Testing Ground

“Use lunar exploration activities to further science, and to develop and test new approaches, technologies, and systems, including use of lunar and other space resources, to support sustained human space exploration to Mars and other destinations.”

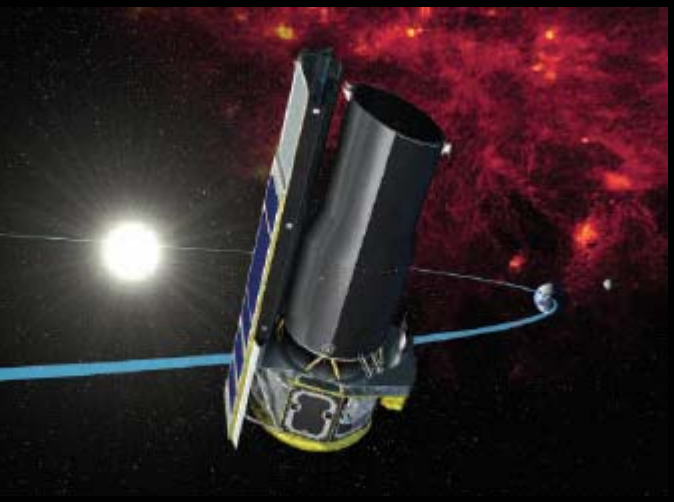
Robotic Exploration of Mars

"Conduct robotic exploration of Mars to search for evidence of life, to understand the history of the solar system, and to prepare for future human exploration"

The stunning images we are now receiving from the *Spirit* and *Opportunity* rovers at Mars are just the beginning.

Enhanced Robotic Trailblazers

"Conduct advanced telescope searches for Earth-like planets"



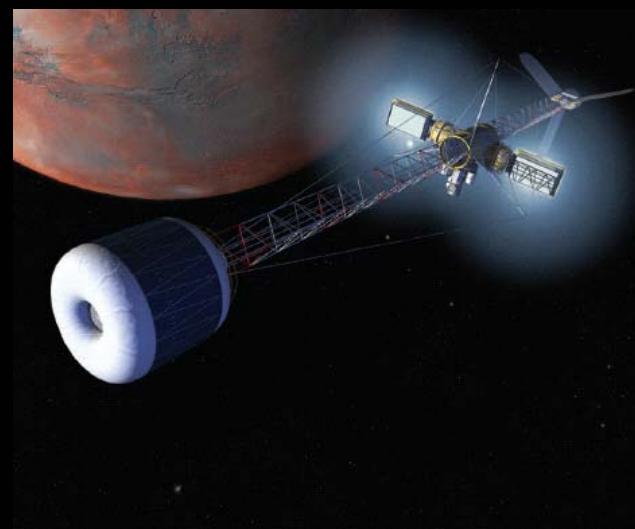
In this decade alone, NASA plans to launch at least two robotic missions to the Moon, five robotic missions to Mars, three space telescopes that will expand our search for planets circling other stars, and four missions to other planets, comets, and asteroids.

Technology Development

“Develop and demonstrate power generation, propulsion, life support and other key capability”

Breakthrough technologies, such as nuclear power and propulsion, optical communications, and potential use of space resources, will be demonstrated as part of robotic exploration missions.

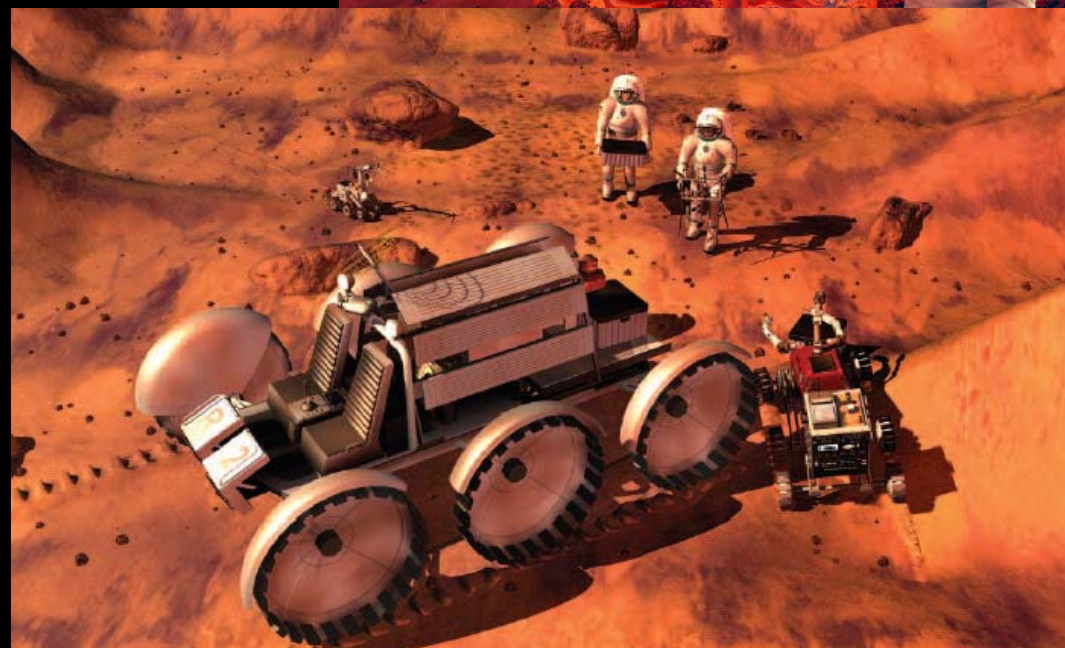
The challenges of designing these systems will accelerate the development of fundamental technologies that are critical not only to NASA, but also to the Nation’s economic and national security



Mars As A Destination

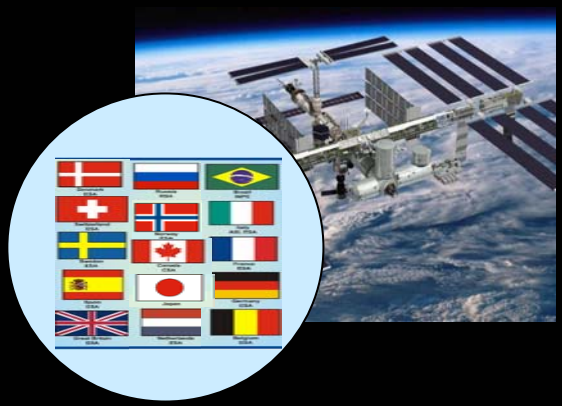
“Conduct human expeditions to Mars after acquiring adequate knowledge”

The timing of the first human research missions to Mars will depend on discoveries from robotic explorers, the development of techniques to mitigate Mars hazard, advances in capabilities for sustainable exploration, and available resources



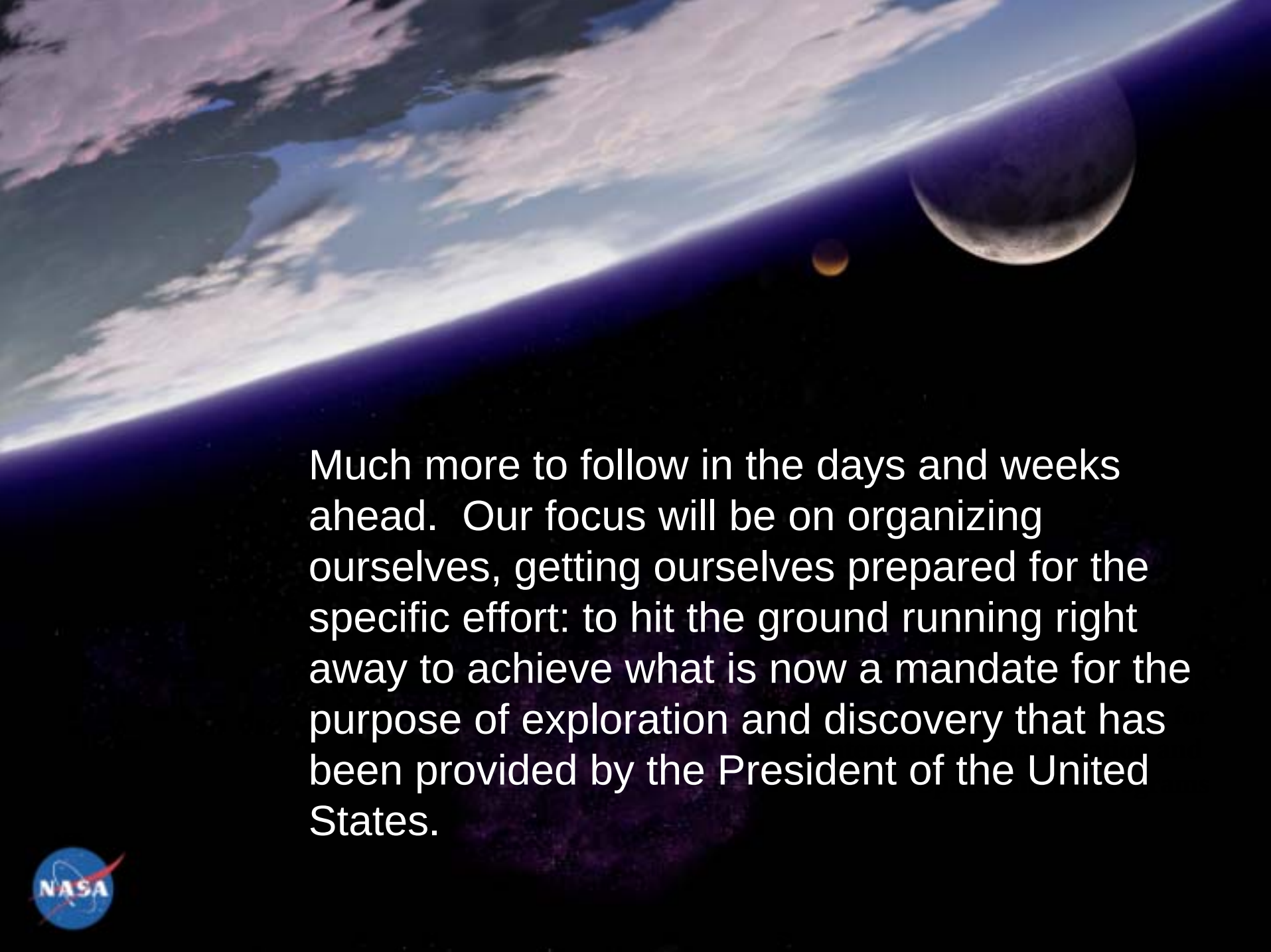
International Participation

“Pursue opportunities for international participation to support U.S. space exploration goals”



Current International Participation
In the Space Station

NASA will actively seek international partners and lead the space agencies of these partners in executing exploration activities.



Much more to follow in the days and weeks ahead. Our focus will be on organizing ourselves, getting ourselves prepared for the specific effort: to hit the ground running right away to achieve what is now a mandate for the purpose of exploration and discovery that has been provided by the President of the United States.